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In the Claims:**In the Claims:**

Claims 2, 5, 8, 12-15, and 23-24 have been cancelled.

Claims 1 and 25 have been amended.

Claims 28-32 have been added.   Underlines indicate additions; strikeouts indicate deletions. The full set of claims is as set forth below.

1   1.   (Currently Amended) A customer profiling apparatus for
2   conducting customer telephone behavior pattern analysis on telephone call
3   records including telephone call data, comprising:
4   processing circuitry operative to process customer telephone call
5   records;
6   a data warehouse coupled with the processing circuitry and
7   configured to store the processed customer telephone call records;
8   an OnLine Analytical Processing (OLAP) based scalable profiling
9   engine communicating with the data warehouse and operative to build and
10   update customer behavior profiles by mining the customer telephone call records
11   that flow into the data warehouse; and
12   at least one computer program, performed by the profiling engine,
13   and operative to define behavior profiles defined at least in part by probability
14   distributions, using data from the telephone call records, as data cubes and
15   derive similarity measures on patterns extracted from the behavior profiles;
16   wherein the behavior profiles are provided as two input calling
17   pattern cubes, C_1 and C_2, and a similarity cube, C_s, is an output of a comparison
18   between C_1 and C_2, wherein the similarity cube, C_s, represents a pair of
19   corresponding sub-cubes of C_1 and C_2, and wherein C_1 and C_2 are count-cubes,
20   a sub-cube is treated as a bag, and cell-wise comparison results are summarized
21   based on bag overlap, the count cubes having non-negative integer cell values,
22   and the bag overlap enables comparison of corresponding sub-cubes of distinct
23   count cubes.

1   2.   (Cancelled)

1   3.   (Original) The apparatus of claim 1 wherein the profiling
2   engine comprises a commercial data warehouse server and a multi-dimensional
3   OLAP server.

1   4.   (Original) The apparatus of claim 1 wherein the profiling
2   engine implements multi-level, multi-dimensional pattern analysis and
3   comparison.

1   5.   (Cancelled)

1   6.   (Original) The apparatus of claim 1 wherein similarity
2   measures are defined and computed on the patterns extracted from the behavior
3   profiles.

1   7.   (Original) The apparatus of claim 1 wherein the computer
2   program is further operative to compare the data cubes with similarity measures
3   identifying fraud so as to extract fraud detection from the behavior profiles.

1   8.   (Cancelled)

1   9.   (Previously presented) The apparatus of claim 1 wherein the
2   behavior profiles are analyzed against a personalized threshold to detect caller
3   fraud.

1   10.   (Original) The apparatus of claim 1 wherein the customer
2   records comprise customer call records, the profiling engine builds and updates
3   customer calling behavior profiles by mining the customer call records, and the
4   computer program derives similarity measures on patterns extracted from the
5   call behavior profiles.

1   11.   (Previously presented) A profiling apparatus, comprising:

2   a data warehouse for storing customer records including telephone
3   call data;

4   a profiling engine configured to communicate with the data
5   warehouse and operative to generate customer telephone calling behavior
6   profiles from the customer records within the data warehouse, the profiling
7   engine being configured to define customer telephone calling behavior profiles
8   using probability distributions, and to compute the customer telephone calling
9   behavior profiles using OLAP operations on multi-dimensional and multi-level
10 data cubes, one multi-level data cube being a profile cube, another multi-level
11 data cube being a profile-snapshot cube, and yet another data cube being a
12 profile cube formed by merging together the profile cube and the profile-
13 snapshot cube; and

14   a computer application program implemented on the profiling
15 engine and operative to represent behavior profiles as patterns, using the
16 telephone call data, and derive similarity measures of the patterns usable to
17 profile customer behavior and detect fraud by deriving calling pattern cubes from
18 the profile cubes using a probability distribution-based calling pattern, treating a
19 sub-cube as a bag, and summarizing cell-wise comparison results based on bag
20 overlap.

1   12-15. (Cancelled)

1   16.   (Previously presented) The apparatus of claim 11 wherein
2   the updated profile cube is stored within a profile table of the data warehouse
3   such that subsequent customer profiling utilizes customer records from the data
4   warehouse comprising the updated profile cube.

1   17.   (Previously presented) A method for comparing customer
2   behavior patterns, comprising:

3   providing call data in the form of call data records to a data
4   warehouse;

5   loading the call data records into a multidimensional database of an

6   OLAP server;

7   maintaining profiles by staging data between the data warehouse

8   and the OLAP multidimensional database;

9   generating a profile-snapshot cube accommodating multiple

10   customers;

11   in combination with generating the profile-snapshot cube,

12   generating a profile cube for the same set of customers from the data

13   warehouse;

14   updating the profile cube by merging the profile cube with the

15   profile-snapshot cube;

16   storing the updated profile cube in the data warehouse; and

17   deriving similarity measures of patterns usable to profile customer

18   behavior and detect fraud by deriving calling pattern cubes from the updated

19   profile cube using a probability distribution-based calling pattern, treating a sub-

20   cube as a bag, and summarizing cell-wise comparison results based on bag

21   overlap.

1   18.   (Original) The method of claim 17 wherein the data

2   warehouse comprises profile tables configured to store the profile cube.

1   19.   (Previously presented) The method of claim 17 wherein the

2   updated profile cube is subdivided into a plurality of individual calling pattern

3   cubes, each representative of individual customers, and further comprising

4   comparing_calling patterns that have been derived from customer calling

5   behavior profiles.

1   20.   (Previously presented) The method of claim 19 further

2   comprising the steps of reporting, analyzing, and visualizing of one of the calling

3   pattern cubes for an individual customer.

1   21.   (Previously presented) The method of claim 19 further

2   comprising retrieving profile tables to generate the profile cubes, retrieving call

3   data tables to create profile-snapshot cubes that have a same dimension of a

4   profile cube to facilitate merging by addition, deriving individual customer-based

5   calling pattern cubes from the profile cubes, analyzing individual calling patterns

6   in multiple dimensions and multiple levels, and computing a similarity of calling

7   patterns that belong to different customers or to a same customer over different

8   profiling periods.

1   22.   (Previously presented) The apparatus of claim 1 wherein a

2   cell of C_s is mapped into a pair of corresponding sub-cubes of C_1 and C_2.

1   23-24. (Cancelled)

1   25.   (Currently amended) A profiling apparatus, comprising:

2   a data warehouse for storing customer records including telephone

3   call data;

4   a profiling engine configured to communicate with the data

5   warehouse and operative to generate customer telephone calling behavior

6   profiles from the customer records within the data warehouse, the profiling

7   engine being configured to define customer telephone calling behavior profiles

8   using probability distributions, and to compute the customer telephone calling

9   behavior profiles using OLAP operations on multi-dimensional and multi-level

10   data cubes, one multi-level data cube being a profile cube, another multi-level

11   data cube being a profile-snapshot cube, and yet another data cube being a

12   profile cube formed by merging together the profile cube and the profile-

13   snapshot cube; and

14   a computer application program implemented on the profiling

15   engine and operative to represent behavior profiles as patterns, using the

16   telephone call data, and derive similarity measures of the patterns usable to

17   profile customer behavior and detect fraud by deriving volume based calling

18   pattern cubes comprising count-cubes from the profile cubes using a probability

19   distribution-based calling pattern, treating a sub-cube as a bag, and summarizing

20   cell-wise comparison results based on bag overlap using cell-to-subcube

21   <u>mapping, the count cubes having non-negative integer cell values, and the bag</u>

22   <u>overlap enables comparison of corresponding sub-cubes of distinct count cubes.</u>

1   26.   (Previously presented) The apparatus of claim 25 wherein

2   the computer application program is operative to implement projection cell-to-

3   subcube mapping.

1   27.   (Previously presented) The apparatus of claim 25 wherein

2   the computer application program is operative to implement change level cell-to-

3   subcube mapping.

Please add the following new claims:

1   28.   (New) A customer profiling apparatus for conducting

2   customer telephone behavior pattern analysis on telephone call records including

3   telephone call data, comprising:

4   processing circuitry operative to process customer telephone call

5   records;

6   a data warehouse coupled with the processing circuitry and

7   configured to store the processed customer telephone call records;

8   an OnLine Analytical Processing (OLAP) based scalable profiling

9   engine communicating with the data warehouse and operative to build and

10   update customer behavior profiles by mining the customer telephone call records

11   that flow into the data warehouse; and

12   at least one computer program, performed by the profiling engine,

13   and operative to define behavior profiles defined at least in part by probability

14   distributions, using data from the telephone call records, as data cubes and

15   derive similarity measures on patterns extracted from the behavior profiles;

16   wherein the behavior profiles are provided as two input calling

17   pattern cubes, C_1 and C_2, and a similarity cube, C_s, is an output of a comparison

18   between C_1 and C_2, wherein the similarity cube, C_s, represents a pair of

19   corresponding sub-cubes of C_1 and C_2, and wherein C_1 and C_2 are count-cubes,

20   a sub-cube is treated as a bag, and cell-wise comparison results are summarized

21 based on bag overlap, wherein each cell of C_s represents the similarity of a pair

22 of corresponding sub-cubes, a cube having a set of dimensions and each cell of

23 the cube being identified by a value from each of the dimensions.

1   29. (New) The apparatus of claim 28, wherein an element of the

2 bag is identified by a list of dimension values underlying a cell of the cube, and a

3 count of the element is represented by a cell value.

1   30. (New) The apparatus of claim 28, wherein the count cubes

2 having non-negative integer cell values, and the bag overlap enables comparison

3 of corresponding sub-cubes of distinct count cubes.

1   31. (New) The apparatus of claim 28, wherein each cell of C_s

2 represents the similarity of a pair of corresponding sub-cubes.

1   32. (New) The apparatus of claim 1, wherein each cell of C_s

2 represents the similarity of a pair of corresponding sub-cubes.